

Precalculus Algebra Recommended Competencies

Recommended Competencies	Student Learning Outcomes
The Corequisite at Scale Task Force offers the following <i>possible</i> topics of study for a Precalculus Algebra, corequisite course. These topics include just-in-time learning of foundational skills and review of credit-bearing, course content.	The Missouri Math Pathways Task Force has determined the following Student Learning Outcomes as the minimum requirements of a credit-bearing, entry-level, college course in precalculus algebra reasoning.

I. Foundations of Functions Students will use multiple representations of different function types to investigate quantities and describe relationships between quantities. Specifically, students will be able to:	
Use multiple representations of functions to interpret and describe how two quantities change together.	
Possible Corequisite Topics	Pathways Initiative Student Learning Outcomes
<ul style="list-style-type: none"> • Use interval notation • Interpret radical and rational expressions • Evaluate functions • Apply the order of operations • Recognize relationship between inputs and outputs of functions • Sketch graphs of common functions • Interpret inequality symbols 	<ul style="list-style-type: none"> ▪ Identify constraints on quantities and domains. ▪ Distinguish dependent and independent variables. ▪ Identify domains and ranges. ▪ Effectively communicate using function notation.
Measure, compute, describe and interpret rates of change of quantities embedded in multiple representations.	
Possible Corequisite Topics	Pathways Initiative Student Learning Outcomes
<ul style="list-style-type: none"> • Calculate and interpret slope • Explain a rate of change in terms of slope including appropriate units 	<ul style="list-style-type: none"> ▪ Identify constant rates of change. ▪ Determine average rates of change. ▪ Be able to estimate instantaneous rates of change.
Use appropriate tools and representations to investigate the patterns and relationships present in multiple function types.	
Possible Corequisite Topics	Pathways Initiative Student Learning Outcomes
<ul style="list-style-type: none"> • Graph basic functions • Solve algebraic equations • Identify domains and ranges • Use calculators or computer software in accordance to requirements in Pathways course 	<ul style="list-style-type: none"> ▪ Work effectively with the following functions: linear, quadratic, exponential, logarithmic, rational, piecewise and absolute value.

II. Analysis of Functions Students will describe characteristics of different function types and convert between different representations and algebraic forms to analyze and solve meaningful problems. Specifically, students will be able to:	
Create, use and interpret linear equations and convert between forms as appropriate.	
<i>Possible Corequisite Topics</i>	<i>Pathways Initiative Student Learning Outcomes</i>
<ul style="list-style-type: none"> • Read information from graphs, figures, tables, etc. • Perform operations with fractions 	<ul style="list-style-type: none"> ▪ Identify important values (i.e. slope and intercepts) from multiple representations. ▪ Determine equations of lines given one point and the slope, two points or statements about proportional relationships.
Create, use and interpret exponential and logarithmic equations and convert between forms as appropriate.	
<i>Possible Corequisite Topics</i>	<i>Pathways Initiative Student Learning Outcomes</i>
<ul style="list-style-type: none"> • Use properties of logarithms • Use rules of exponents • Understand inverse relationships between exponential and logarithmic functions 	<ul style="list-style-type: none"> ▪ Explain exponential growth as constant percentage rate of change. ▪ Interpret half-life and doubling time to create decay and growth models. ▪ Recognize similarities and differences between linear and exponential functions. ▪ Recognize the role of e as a natural base ▪ Describe long-term behavior of exponential models. ▪ Apply the inverse relationship between exponential and logarithmic functions.
Create, use and interpret polynomial, power and rational functions.	
<i>Possible Corequisite Topics</i>	<i>Pathways Initiative Student Learning Outcomes</i>
<ul style="list-style-type: none"> • Perform operations on polynomials • Create graphs of basic functions • Solve algebraic equations • Identify where a function is increasing, decreasing, or constant • Use the quadratic formula • Find domain of rational functions • Use function notation (i.e. evaluate $f(-x)$) 	<ul style="list-style-type: none"> ▪ Recognize how power functions are different from exponential functions. ▪ Determine whether a graph has symmetry and whether a function is even or odd. ▪ Determine end behavior, maximum, minimum and turning points of a graph. ▪ Find roots of a function and correctly graph the function. ▪ Graph rational functions and find vertical, horizontal and oblique asymptotes.

II. Analysis of Functions (continued)	
Students will describe characteristics of different function types and convert between different representations and algebraic forms to analyze and solve meaningful problems. Specifically, students will be able to:	
Construct, use and describe transformations, operations, compositions and inverses of functions.	
<i>Possible Corequisite Topics</i>	<i>Pathways Initiative Student Learning Outcomes</i>
<ul style="list-style-type: none"> • State the domains and ranges of functions • Perform operations on functions • Perform integer operations • Define the term “function” • Sketch the graphs of basic functions • Solve for the indicated variable 	<ul style="list-style-type: none"> ▪ Describe how the graph of a function can be the result of vertical and horizontal shifts, stretches, compressions, and reflections of the graph of a basic function. ▪ Perform arithmetic operations with functions and describe the domain. ▪ Create new functions by composing basic functions and describe the domain. ▪ Decompose a composite function into basic functions. ▪ Determine if a function is one-to-one, and if so, find the inverse and describe its domain and range.

III. Algebraic Reasoning Students will identify and apply algebraic reasoning to write equivalent expressions, solve equations and interpret inequalities. Specifically, students will be able to:	
Use algebraic techniques to simplify expressions and locate roots.	
<i>Possible Corequisite Topics</i>	<i>Pathways Initiative Student Learning Outcomes</i>
<ul style="list-style-type: none"> • Factor polynomials • Solve algebraic equations • Simplify radicals • Solve compound inequalities • Graph inequalities in one variable • Perform integer operations • Define the imaginary unit 	<ul style="list-style-type: none"> ▪ Solve quadratic equations by factoring, the square root property, completing the square, and the quadratic formula. ▪ Solve quadratic, absolute value, polynomial and rational inequalities. ▪ Perform operations with complex numbers. ▪ Determine complex roots of polynomials.
Use algebraic reasoning to simplify a variety of expressions and find roots of equations involving multiple function types.	
<i>Possible Corequisite Topics</i>	<i>Pathways Initiative Student Learning Outcomes</i>
<ul style="list-style-type: none"> • Use rules of exponents • Solve algebraic equations 	<ul style="list-style-type: none"> ▪ Apply properties of exponents and logarithms. ▪ Solve polynomial, radical, rational, exponential, and logarithmic equations.
Use rational exponents to express and simplify a variety of expressions and solve equations.	
<i>Possible Corequisite Topics</i>	<i>Pathways Initiative Student Learning Outcomes</i>
<ul style="list-style-type: none"> • Use rules of exponents • Identify and factor out the greatest common factor 	<ul style="list-style-type: none"> ▪ Factor out common rational powers. ▪ Simplify fractional expressions involving rational exponents.
Solve and apply systems of equations and inequalities.	
<i>Possible Corequisite Topics</i>	<i>Pathways Initiative Student Learning Outcomes</i>
<ul style="list-style-type: none"> • Translate written statements into algebraic equations • Perform operations on real numbers • Solve equations 	<ul style="list-style-type: none"> ▪ Set up and solve systems of equations. ▪ Perform matrix operations. ▪ Use matrices to solve systems of linear equations. ▪ Graph systems of inequalities.